CLAIMS

1. A method of reducing a phase error caused by a plurality of error sources in a signal which is present in a digital frequency representation in the form of a sequence of a plurality of digital partial signals which are associated with a number of subcarriers (k) of a carrier, comprising, for each partial signal, the steps of:

- equalization of the partial signal (Y(i,k)),

- estimation of the phase error of the equalized partial signal (X(i,k)), and

- correction of the estimated phase error of the equalized partial signal,

characterized in that:

- the equalization step includes a step of at least partially eliminating an accumulation of a phase error of the partial signal, caused by a sampling frequency error, over the sequence of the partial signals, such that the accumulation is negligible, and

- the estimation step includes a step of detecting a plurality of predetermined pilot signals and a step of determining a phase correction factor on the basis of the detected pilot signals, wherein at least one multiplication operation is carried out solely by means of shift and adding operations.

2. A method as set forth in claim 1 characterized in that the equalization step includes a step of division of the partial signal by a complex second signal which has the phase of the partial signal preceding in the sequence of the partial signals.

3. A method as set forth in claim 2 characterized in that the second signal represents a frequency response function of the associated subcarrier for the preceding partial signal in the sequence of partial signals.

4. A method as set forth in claim 3 characterized by a step, effected for each partial signal with the exception of the pilot partial signals, of determining the frequency response function on the basis of a preceding partial signal in the sequence of partial signals.

5. A method as set forth in claim 4 characterized in that the step of determining the frequency response function includes a division of the preceding partial signal in the sequence by a third signal, wherein the third signal represents the equalized, phase-corrected and decoded and then recoded preceding partial signal.

6. A method as set forth in claim 1 characterized in that there are provided 52 subcarriers.

7. A method as set forth in claim 6 characterized in that there are provided four pilot subcarriers for the transmission of pilot signals with which the ordinal numbers –21, -7, 7 and 21 are associated with the following numbering of the subcarriers: -26, -25, -24, ..., -1, 1, 2, 3, ..., 26.

8. A method as set forth in claim 7 characterized in that the pilot signals are present at the beginning of the sequence of partial signals.

9. A method as set forth in claim 8 characterized in that the phase correction factor is determined utilizing the pilot partial signals without a multiplication operation.

10. A method as set forth in claim 1 characterized in that the correction step includes a step of complex multiplication of the equalized partial signal with the phase correction factor.

11. A method as set forth in claim 10 characterized in that the estimation step includes a step of calculating the following parameters on the basis of the pilot signals:

$$\cos(\phi_0) = (1/4)(\Re e\{P_{-21}\} + \Re e\{P_{-7}\} + \Re e\{P_{+7}\} + \Re e\{P_{+21}\}),$$
$$\sin(\phi_0) = (1/4)(\Im m\{P_{-21}\} + \Im m\{P_{-7}\} + \Im m\{P_{+7}\} + \Im m\{P_{+21}\}),$$
$$2\pi p_0\sin(\phi_0) \approx (2\Re e\{P_{-21}\}+3\Re e\{P_{-7}\}-3\Re e\{P_{+7}\}-2\Re e\{P_{+21}\})/128,$$
$$-2\pi p_0\cos(\phi_0) \approx (2\Im m\{P_{-21}\}+3\Im m\{P_{-7}\}-3\Im m\{P_{+7}\}-2\Im m\{P_{+21}\})/128,$$

wherein P_{-21}, P_{-7}, P_{+7}, P_{+21} denote pilot signals and $\Re e$ and $\Im m$ denote the operation of determining the real and imaginary part respectively.

12. A method as set forth in claim 9 characterized in that the estimation step includes a step of storing the parameters $2\pi p_0\sin(\phi_0)$ and $-2\pi p_0\cos(\phi_0)$ in a respective first register.

13. A method as set forth in claim 12 characterized in that the estimation step includes a first step of multiplying the respective content of the first register by a factor 26, wherein said multiplication operation is effected by means of a reduction $26 = 2^5 - 2^2 - 2$ in the form of shift and adding operations.

14. A method as set forth in claim 13 characterized in that the calculated product is written into a second register.

15. A method as set forth in claim 14 characterized in that in the case of a subsequent partial signal the correction step after the multiplication step includes a step of inverting the content of the first register, a step of adding the inverted content of the first register and the content of the second register, and a step of overwriting the second register with the calculated sum.

16. A phase correction unit including a first signal input and a computing unit for determining a complex phase correction factor by means of arithmetic operations which include multiplication, characterized in that there is provided a second signal input to which the computing unit is connected, and at least one multiplication operation is implemented in

the form of at least one shift operator in conjunction with at least one adder.

17. A phase correction unit as set forth in claim 16 characterized in that all multiplication operations are implemented in the form of at least one shift operator in conjunction with at least one adder.

18. A phase correction unit as set forth in claim 16 characterized in that multiplication with an invariable factor is implemented in the form of a reduction of the factor in powers of 2 of the kind $a_0\,2^0 + a_1\,2^1 + a_2\,2^2 + \ldots$, with $a_0, a_1, a_2, \ldots = 1$ or -1.

19. A phase correction unit as set forth in claim 16 characterized in that the computing unit is adapted to determine the following parameters with the signals (P_{-21}, P_{-7}, P_{+7}, P_{+21}) received by way of the second signal input:

$$\cos(\phi_0) = (1/4)(\Re e\{P_{-21}\} + \Re e\{P_{-7}\} + \Re e\{P_{+7}\} + \Re e\{P_{+21}\}),$$
$$\sin(\phi_0) = (1/4)(\Im m\{P_{-21}\} + \Im m\{P_{-7}\} + \Im m\{P_{+7}\} + \Im m\{P_{+21}\}),$$
$$2\pi p_0 \sin(\phi_0) \approx (2\Re e\{P_{-21}\}+3\Re e\{P_{-7}\}-3\Re e\{P_{+7}\}-2\Re e\{P_{+21}\})/128,$$
$$-2\pi p_0 \cos(\phi_0) \approx (2\Im m\{P_{-21}\}+3\Im m\{P_{-7}\}-3\Im m\{P_{+7}\}-2\Im m\{P_{+21}\})/128,$$

wherein P_{-21}, P_{-7}, P_{+7}, P_{+21} denote pilot signals and $\Re e$ and $\Im m$ denote the operation of determining the real and imaginary part respectively.

20. A phase correction unit as set forth in claim 19 characterized in that for determining each of the parameters there is provided a specific parameter calculation circuit of corresponding configuration.